WHAT IS CLAIMED IS:

**1.** A container defect detection apparatus, comprising:

a fluid tank;

a rotatable cup mounted within the fluid tank, which rotatable cup is configured to receive a first region of a container;

a rotatable cap configured to receive a second region of the container;

an engagement mechanism which moves the rotatable cup or rotatable cap towards or away from each other to engage the container;

a drive train coupled to the rotatable cup or the rotatable cap, which drive train turns the rotatable cup or rotatable cap; and,

an adjustable receiving/transmitting transducer positioned to mount proximal to the container.

**2.** The container defect apparatus of claim **1**, wherein the cup comprises a centering ring.

**3.** The container defect apparatus of claim **1**, wherein the cap comprises a rubber collar.

**4.** The container defect apparatus of claim **1**, the drive train comprising:

a motor mounted outside of the fluid tank, which motor is coupled to a gearbox, which gear box is coupled to an output shaft, which output shaft passes through a bearing housing mounted in a wall of the fluid tank and into contact with the cap.

**5.** The container defect apparatus of claim **1**, wherein the rotatable cap is shaped to mount over a cylinder valve.

**6.** The container defect apparatus of claim **1**, wherein the rotatable cup is coupled to a tailstock assembly which comprises the engagement mechanism.

**7.** The container defect apparatus of claim **1**, wherein the rotatable cup is coupled to a tailstock assembly which comprises the engagement mechanism, which engagement mechanism comprises a pneumatic cylinder which moves the rotatable cup into engagement with the container.

**8.** The container defect apparatus of claim **1**, wherein the engagement mechanism comprises a pneumatic cylinder.

**9.** The container defect apparatus of claim **1**, wherein: the rotatable cup is housed in a tailstock; the engagement mechanism comprises a slide upon which the tailstock moves towards or away from the drive train; and, the drive train is coupled to the rotatable cap.

**10.** The container defect apparatus of claim **1**, comprising a receiving transducer display coupled to the receiving transducer, which display displays an output of the receiving/transmitting transducer.

**11.** The container defect apparatus of claim **10**, wherein the display is a computer screen and wherein the receiving transducer is coupled to the computer, which computer comprises instructions for detecting one or more signal from the receiving transducer.

**12.** The container defect apparatus of claim **10**, wherein the display is a computer screen and wherein the receiving transducer is coupled to the computer, which computer comprises instructions for moving the receiving/transmitting transducer.

**13.** The container defect apparatus of claim **10**, wherein the display is a computer screen and wherein the receiving transducer is coupled to the computer, which computer comprises instruction for directing one or more signal outputs from the receiving/transmitting transducer.

**14.** The container defect apparatus of claim **1**, wherein the receiving/transmitting transducer is configured to perform a circumferential scan of the container.

**15.** The container defect apparatus of claim **1**, wherein the receiving/transmitting transducer is configured to perform a longitudinal scan of the container.

**16.** The container defect apparatus of claim **1**, wherein the receiving/transmitting transducer is configured to perform a thickness scan of the container.

**17.** The container defect apparatus of claim **1**, wherein the receiving/transmitting transducer is height or angle-adjustable.

**18.** The container defect apparatus of claim **1**, wherein the receiving/transmitting transducer is mounted on a search tube.

**19.** The container defect apparatus of claim **18**, wherein the search tube is coupled to a rotatable search tube holder.

**20.** The container defect apparatus of claim **19**, wherein the rotatable search tube holder is coupled to an x-y-z translation mechanism which comprises an x-axis linear table, an x-axis motor which drives the search tube holder along the x-axis linear table, and x-axis encoder which tracks motion of the search tube holder along the x-axis linear table, a y-axis linear table, a y-axis motor which drives the search tube holder along the y-axis linear table, a y-axis encoder which tracks motion of the search tube holder along the y-axis linear table, a z-axis linear table, a z-axis motor which drives the search tube holder along the z-axis linear table, and a z-axis encoder which tracks motion of the search tube holder along the z-axis.

**21.** The container defect apparatus of claim **1**, wherein the receiving/transmitting transducer is a right angle transducer.

**22.** The container defect apparatus of claim **1**, wherein the fluid tank is partly filled with water.

**23.** The container defect apparatus of claim **1**, further comprising a container mounted between the rotatable cap and the rotatable cup.

**24.** The container defect apparatus of claim **23**, wherein the container is a cylinder comprising a cylinder valve in the second region, wherein the rotatable cap is a drive collar shaped to mount over the cylinder valve.

**25.** The container defect apparatus of claim **1**, wherein the apparatus is portable.

**26.** The container defect apparatus of claim **1**, wherein the apparatus further comprises system software for aligning the transmitting/receiving transducer or for analyzing a signal from the transmitting/receiving transducer.

**27.** A method of testing for the presence of a container defect, comprising:

immersing a container in water;

spinning the container in the water;

moving an ultrasonic transmitting/receiving transducer into proximity with a first circumferential region of the container, which first circumferential region is located at a first angle relative to a central axis of the container;

moving the ultrasonic transmitting receiving transducer along the first circumferential region for a first length while transmitting a first set of ultrasonic pulses from the transmitting/receiving transducer into the container;

detecting a first set of signals resulting from the first set of ultrasonic pulses;

moving the ultrasonic transmitting/receiving transducer into proximity with a second circumferential region of the container;

moving the ultrasonic transmitting receiving transducer along a second length of the second circumferential region while transmitting a second set of ultrasonic pulses from the transmitting/receiving transducer into the container, which second circumferential region is at a second angle relative to the central axis of the container, wherein the first and second angles are different;

detecting a second set of signals resulting from the second set of ultrasonic pulses; and,

determining from the first and second detected sets of signals whether a defect is present.

**28.** The method of claim **27**, wherein the container is a cylinder.

**29.** The method of claim **27**, wherein container is rotated in an container defect detection apparatus, the apparatus comprising:

a fluid tank which holds the water;

a rotatable cup mounted within the fluid tank, which rotatable cup is configured to receive a first region of the container;

a rotatable cap configured to receive a second region of the container;

an engagement mechanism which moves the first or second rotatable mechanism towards or away from each other to engage the container; and,

a drive train coupled to the rotatable cup or the rotatable cap, which drive train turns the rotatable cup or rotatable cap;

wherein the container is rotated by engaging the rotatable cup and rotatable cap against the container by activating the engagement mechanism, and rotating the rotatable cup and rotatable cap with the drive train.

**30.** The method of claim **29**, further comprising transporting the container defect detection apparatus to a site proximal to the container prior to mounting the container in the container defect detection apparatus.

**31.** The method of claim **27**, wherein the transmitting/receiving transducer is moved into proximity with the first circumferential region of the container such that a 45 degree shear wave is propagated in a wall of the container.

**32.** The method of claim **27**, wherein the transmitting/receiving transducer is moved into proximity with the first circumferential region of the container above the central axis of the container such that a 45 degree shear wave is propagated in a wall of the container.

**33.** The method of claim **27**, wherein the transmitting/receiving transducer is moved into proximity with the first circumferential region of the container below the central axis of the container such that a 45 degree shear wave is propagated in a wall of the container.

**34.** The method of claim **27**, wherein the transmitting/receiving transducer is positioned proximal to the first or second circumferential regions of the container to provide a longitudinal scan of a wall of the container.

**35.** The method of claim **27**, wherein the transmitting/receiving transducer is positioned proximal to the first or second circumferential region of the container to provide a circumferential scan of a wall of the container.

**36.** The method of claim **27**, wherein the receiving/transmitting transducer is mounted on a search tube which is coupled to a rotatable search tube holder, wherein the rotatable search tube holder is coupled to an x-y-z translation mechanism which comprises an x-axis linear table, an x-axis motor which drives the search tube holder along the x-axis linear table, and x-axis encoder which tracks motion of the search tube holder along the x-axis linear table, a y-axis linear table, a y-axis motor which drives the search tube holder along the y-axis linear table, a y-axis encoder which tracks motion of the search tube holder along the y-axis linear table, a z-axis linear table, a z-axis motor which drives the search tube holder along the z-axis linear table, and a z-axis encoder which tracks motion of the search tube holder along the z-axis.

**37.** The method of claim **36**, wherein the receiving/transmitting transducer is positioned proximal to the first or second circumferential region by engaging one or more of: the x-axis motor, the y-axis motor, or the z-axis motor.

**38.** The method of claim **36**, wherein the receiving/transmitting transducer is moved along the first or second length of the first or second circumferential region by engaging one or more of: the x-axis motor, the y-axis motor, or the z-axis motor.

**39.** The method of claim **36**, wherein the receiving/transmitting transducer is moved with the x-y-z translation apparatus, which apparatus is controlled by a computer operably coupled to the x-axis encoder, the y-axis encoder, and the z-axis encoder.

**40.** The method of claim **27**, further comprising:

moving the ultrasonic transmitting/receiving transducer into proximity with a third circumferential region of the container;

moving the ultrasonic transmitting receiving transducer along the third circumferential region for a third length while transmitting a third set of ultrasonic pulses from the transmitting/receiving transducer into the container; and,

detecting the third set of signals resulting from the third set of ultrasonic pulses.

**41.** The method of claim **40**, further comprising:

moving the ultrasonic transmitting/receiving transducer into proximity with a fourth circumferential region of the container;

moving the ultrasonic transmitting receiving transducer along the fourth circumferential region for a fourth length while transmitting a fourth set of ultrasonic pulses from the transmitting/receiving transducer into the container; and,

detecting the fourth set of signals resulting from the fourth set of ultrasonic pulses.

**42.** The method of claim **41**, wherein the first, second, third and fourth set of pulses provide for one or more of: a circumferential scan of a wall of the container, a thickness scan of a wall of the container, and a longitudinal scan of a wall of the container.

**43.** The method of claim **41**, further comprising:

moving the ultrasonic transmitting/receiving transducer into proximity with a fifth circumferential region of the container;

moving the ultrasonic transmitting receiving transducer along the fifth circumferential region for a fifth length while transmitting a fifth set of ultrasonic pulses from the transmitting/receiving transducer into the container; and,

detecting the fifth set of signals resulting from the fifth set of ultrasonic pulses.

**44.** The method of claim **41**, wherein the first, second, third, fourth and fifth set of pulses provide for one or more of: a circumferential scan of a wall of the container, a thickness scan of a wall of the container, and a longitudinal scan of a wall of the container.

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